



Geostatistical exploration of spatial variation of summertime temperatures in the Detroit metropolitan region

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Abstract:

Background: Because of the warming climate urban temperature patterns have been receiving increased attention. Temperature within urban areas can vary depending on land cover, meteorological and other factors. High resolution satellite data can be used to understand this intra-urban variability, although they have been primarily studied to characterize urban heat islands at a larger spatial scale. **Objective:** This study examined whether satellite-derived impervious surface and meteorological conditions from multiple sites can improve characterization of spatial variability of temperature within an urban area. **Methods:** Temperature was measured at 17 outdoor sites throughout the Detroit metropolitan area during the summer of 2008. Kriging and linear regression were applied to daily temperatures and secondary information, including impervious surface and distance-to-water. Performance of models in predicting measured temperatures was evaluated by cross-validation. Variograms derived from several scenarios were compared to determine whether high-resolution impervious surface information could capture fine-scale spatial structure of temperature in the study area. **Results:** Temperatures measured at the sites were significantly different from each other, and all kriging techniques generally performed better than the two linear regression models. Impervious surface values and distance-to-water generally improved predictions slightly. Restricting models to days with lake breezes and with less cloud cover also somewhat improved the predictions. In addition, incorporating high-resolution impervious surface information into cokriging or universal kriging enhanced the ability to characterize fine-scale spatial structure of temperature. **Conclusions:** Meteorological and satellite-derived data can better characterize spatial variability in temperature across a metropolitan region. The data sources and methods we used can be applied in epidemiological studies and public health interventions to protect vulnerable populations from extreme heat events. © 2011 Elsevier Inc.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Geographic Feature:

resource focuses on specific type of geography

Climate Change and Human Health Literature Portal

Urban

Geographic Location:

resource focuses on specific location

United States

Health Impact:

specification of health effect or disease related to climate change exposure

Injury

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Population of Concern: A focus of content

Population of Concern:

populations at particular risk or vulnerability to climate change impacts

Low Socioeconomic Status

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content